REMARKS

Status of the Case

The present invention provides methods for producing *in-situ* composite solders having particulate intermetallics homogeneously distributed throughout the solder matrices. The composite solder is made by mixing a conventional solder with the components of the intermetallic phase, heating the mixture until it is non-solid, and rapidly cooling. The solders of this invention provide greater solder joint strength and fatigue resistance than solders among those known in the art.

In the Office Action issued July 16, 2001, all claims are rejected under 35 U.S.C. §102 and/or §103. In this Amendment, Applicants traverse all rejections, and have provided a new claim set, Claims 26-58. The following table shows the general correspondence between the original claims, cancelled in this Amendment, and the new claims:

Original Claim	New Claim
1	26
2	34
3	35
4	35
5	34
6	36
7	37
8	33
9	30
10	31
11	32

Original Claim	New Claim
13	41
14	41
15	41
16	42
20	42
21	47
22	49
23	46
24	42
25	52

Applicants' Invention is Novel

The Examiner rejected Claims 1-6, 8, 9, 14-16, 20, 21, and 23-25 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent 5,527,628, Anderson, et al., issued June 18, 1996. The Examiner stated that Anderson discloses the steps of combining a solder with the components of an intermetallic phase such as Cu or Ag to form a mixture (citing the passage at col. 5, line 59 to col. 6, line 12). The Examiner also stated that the reference teaches chill casting.

Applicants submit that the Examiner has misapprehended the significant differences between the claimed invention and the composition disclosed in Anderson. In particular, Anderson does not teach the addition of the components of an intermetallic phase to a solder material. Rather, Anderson is addressed to a "heretofore unknown ternary eutectic composition consisting essentially of about 93.6 weight % Sn-about 4.7 weight % Ag-about 1.7 weight % Cu having a eutectic melting temperature of about 217°C. and variants of the ternary eutectic composition." This composition is said to

provide "an advantageous microstructure including beta Sn phase and at least two different intermetallic compounds distributed in the Sn phase, one compound including Cu and Sn and another compound including Ag and Sn." Anderson, at col. 2, lines 42-56.

The intermetallic compounds distributed in the Anderson solder are formed from the solder matrix itself, rather than being added to the matrix in a separate processing step. Applicants' invention, on the other hand, starts with a solder which may be a binary or eutectic solder such as that disclosed in Anderson. To this solder, is added the components of an intermetallic phase which are not part of the matrix solder composition. The composition is then processed in such a way as to create a fine dispersion of the intermetallic compounds within the solder matrix.

Thus, the intermetallic phase of the Applicants' solders are added to, rather than made from, the solder matrix. This distinction is underscored in the claims as amended, where it is made clear that the components of the intermetallic phase are added to, rather than made from, a solder matrix. As discussed on page 6 of the specification, the deliberate addition of the intermetallic particles of the Applicants' invention prevents the presence of such particles from concentrating in one portion of the solder (as may happen with solders such as disclosed in Anderson), thereby weakening the solder. During use of the solders of the Applicants' invention, the solder matrix melts while the intermetallic reinforcements remain as solids. Upon cooling, the intermetallic particles remain evenly distributed, thereby avoiding concentrations of particles that weaken the resulting solder joint. This is described on page 12, lines 15-22 of the specification. (The Examiner's reference to the disclosure on page 7, lines 5-9 is inaposite, in that this disclosure of

heating to greater than the melting point of all constituents is during the manufacture of the solder, not during its use.)

Moreover, Anderson fails to disclose a process where the solder is melted, cooled, then remelted and rapidly cooled, such as in Applicants' Claim 42. Anderson also fails to disclose formation of solders having an intermetallic phase with small particle sizes, such as set forth in Applicants' Claims 38-40. Accordingly, Applicants' claims are novel.

Applicants' Invention is Also Nonobvious.

The Examiner also rejected all claims as being obvious, in particular rejecting Claims 7 and 22 as being unpatentable over Anderson in view of the Gibson, et al. article. The Examiner also rejected Claims 10-11 and 13 as being obvious over Anderson in view of U.S. Parent 5,520,752, Lucey, Jr., et al., issued May 28, 1996.

As discussed above, Anderson fails to describe a process by which an intermetallic phase is added to a solder, as opposed to made from a solder. Indeed, Anderson focuses on a novel ternary eutectic solder as having allegedly preferred characteristics. Clearly, by adding materials to the Anderson solder, such as in Applicants' invention, one would make a solder which is significantly different in the composition than the "novel eutectic" of Anderson. Based on the teachings of Anderson, one would expect such a solder to be less preferred. Anderson teaches away from any modification of its disclosed novel eutectic solder. There is certainly no teaching in Anderson, or any of the other references cited by the Examiner, that the addition of a material to a solder in order to form an intermetallic phase would offer any benefit. Creating a homogeneous dispersion of the intermetallic phase in the solder is no where suggested by any of the references.

Accordingly, Applicants' solder compositions are not obvious, and patentable.

Applicants respectfully request allowance of all claims.

Respectfully submitted,

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